National Core (NCore) Multi-pollutant Monitoring Stations:

In October 2006 the United States Environmental Protection Agency (EPA) issued final amendments to the ambient air monitoring regulations for criteria pollutants. These amendments are codified in 40 CFR parts 53 and 58. The purpose of the amendments was to enhance ambient air quality monitoring to better serve current and future air quality needs. One of the most significant changes in the regulations was the requirement to establish National Core (NCore) multi-pollutant monitoring stations. These stations will provide data on several pollutants at lower detection limits and replace the National Air Monitoring Station (NAMS) networks that have existed for several years. The final network plan must be submitted to EPA by July 1, 2009 and the stations must be operational by January 1, 2011.

The NCore Network addresses the following monitoring objectives:

- timely reporting of data to the public through AIRNow, air quality forecasting, and other public reporting mechanisms
- support development of emission strategies through air quality model evaluation and other observational methods
- accountability of emission strategy progress through tracking long-term trends of criteria and non-criteria pollutants and their precursors
- support long-term health assessments that contribute to ongoing reviews of the National Ambient Air Quality Standards (NAAQS)
- compliance through establishing nonattainment/attainment areas by comparison with the NAAQS
- support multiple disciplines of scientific research, including; public health, atmospheric and ecological

Recommended changes to Ambient Air Monitoring Network to accommodate NCore sampling strategy:

Establish an NCore multi-pollutant monitoring station in Eastern Henrico County at the MathScience Innovation Center Site at 2401 Hartman Lane. The location meets the objective for an NCore site and meets urban scale criteria for $PM_{2.5}$, PM_{10}, Ozone, and NO_x. It meets neighborhood scale criteria for Carbon Monoxide.

Monitoring Objective:

Determine compliance with NAAQS; observe pollution trends for national data analysis, provide pollution levels for daily index reporting; and provide data for scientific studies.

Parameter	Designation and purpose	Analysis Method	Sampling Frequency
PM2.5 speciation	NCore/PM2.5 standard: Organic and elemental carbon, major ions and trace metals	Multi-species manual collection method utilizing thermal optical, ion chromatography, gravimetric, and X-ray fluorescence analyses.	24 hour; every 3rd day
PM2.5 FRM mass	NCore/PM2.5 standard	Manual Reference Method utilizing gravimetric analysis.	24 hr. every 3rd day
continuous PM2.5 mass	NCore/AQI	Automated Method utilizing Tapered Element Oscillating Microbalance/ gravimetric analysis	1 hour reporting interval
continuous PM(10-2.5) mass	in anticipation of PM(10-2.5) standard	To Be Determined	
ozone (O3)	NCore/Ozone standard	UV Absorption	Continuous
carbon monoxide (CO)	NCore: trace level (low ppm and below)	trace level non-dispersive infrared analysis	Continuous
sulfur dioxide (SO2)	NCore: capable of trace levels (low ppb)	Pulsed Fluorescence	Continuous
nitrogen oxide (NO)	NCore: capable of trace levels (low ppb)	Chemiluminescense	Continuous
total reactive nitrogen (NOy)	NCore: capable of trace levels (low ppb)	Trace Level Chemiluminescence	Continuous
ammonia (NH3)	currently under consideration	To Be Determined	
nitric acid (HNO3)	currently under consideration	To Be Determined	
surface meteorology	NCore	Air quality measurements approved instrumentation for wind speed, wind direction, humidity, barometric pressure temperature, rainfall, and solar radiation	Continuous

All Parameters identified in red above are already in place at the MSIC site.

Quality Assurance Status:

All Quality Assurance procedures shall be implemented in accordance with 40 CFR 58, Appendix A. DEQ current Quality Assurance Project Plans cover $PM_{2.5}$, Ozone, NOx, and PM2.5 Speciation. For the trace level instruments, a Quality Assurance Project Plan will be developed and submitted for use of the trace level instruments prior to start-up of the fully implemented NCore site. SOPs will be developed for each instrument used at the site.

Area of Representativeness:

40 CFR Part 58 Appendix D provides design criteria for ambient air monitoring. The monitoring objective for the NCore site is to produce data that represents a fairly large area and therefore the spatial scale of the site is important. The spatial scale defines the physical dimensions of the air parcel nearest to a monitoring site throughout which actual pollutant concentrations are reasonably similar. It is determined by the characteristics of the area surrounding the air monitoring site and the site's distance from nearby air pollution sources such as roadways, factories, etc. In the case of urban NCore the spatial scales to be used are neighborhood and urban. The following table shows the area of representativeness for each projected pollutant at the MSIC site.

Spatial Scales for Each Pollutant

Pollutant	Spatial Scale
Ozone	Neighborhood and Urban Scale
NO_x	Neighborhood and Urban Scale
Carbon Monoxide	Neighborhood Scale
SO_2	Neighborhood Scale
$PM_{10}/PM_{2.5}$	Urban

For neighborhood scale the area covered is up to a 4 km radius around the air monitoring site. This area is a mix of commercial, light industry, heavy industrial and residential. In other words it is representative of the Richmond area. Figure 1 below includes a 4 km radius circle around the MSIC site. The map identifies the neighborhoods surrounding the site as well as the Railroad yard in the south west portion of the circle and the portions of the major highways that pass within this circle.

Figure 2. below shows a 50 km radius circle around the MSIC site. The circle includes the entire Richmond MSA and notably incorporates the cities of Hopewell, a heavily industrialized city of 25,000 as well as Colonial Heights and the town of Ashland. This circle includes the entire monitoring network of the Richmond area with the exception of the PM10 monitor in West Point. The Land Use diversity within the circle runs from agricultural to heavily urbanized and includes commercial, light and heavy industrial, major transportation throughways and railroad hubs.

Figure 1. 4 km radius circle around the MathScience Center NCore Site

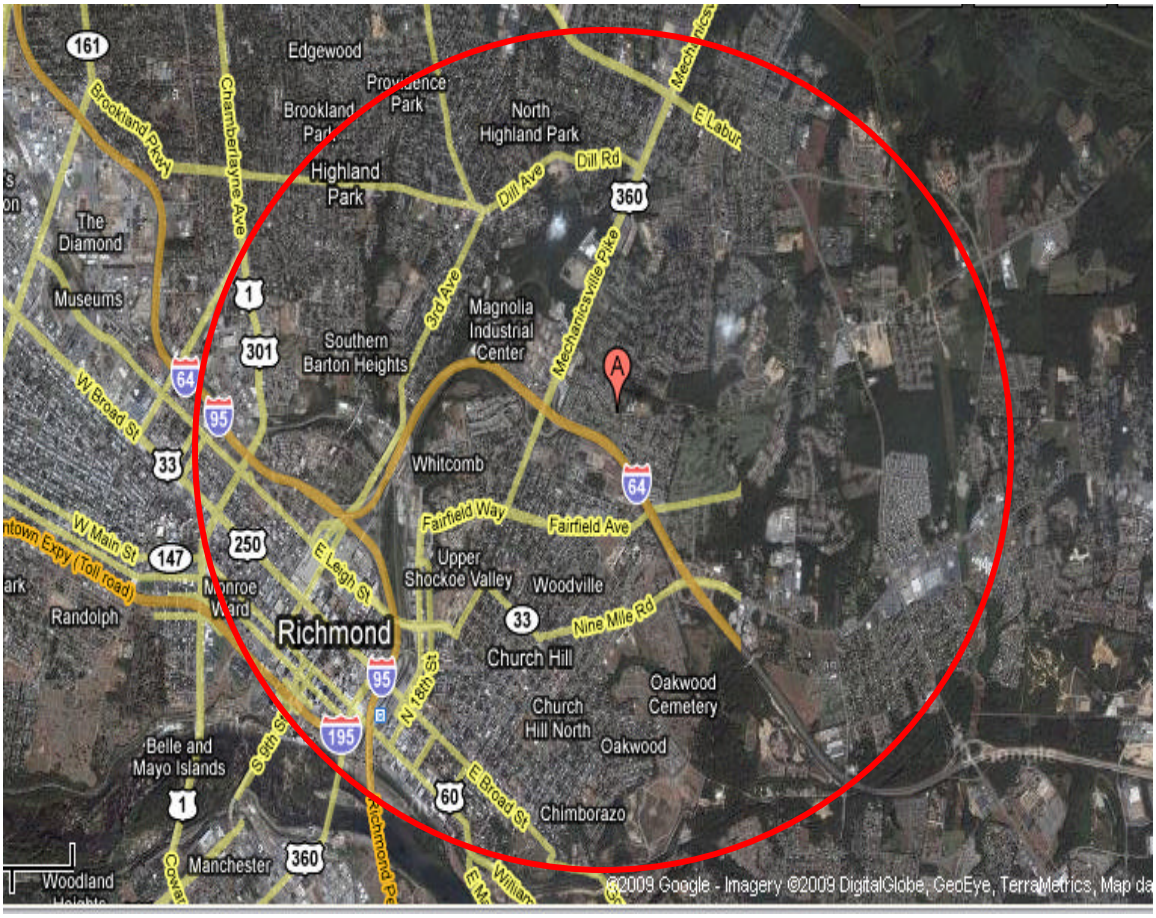
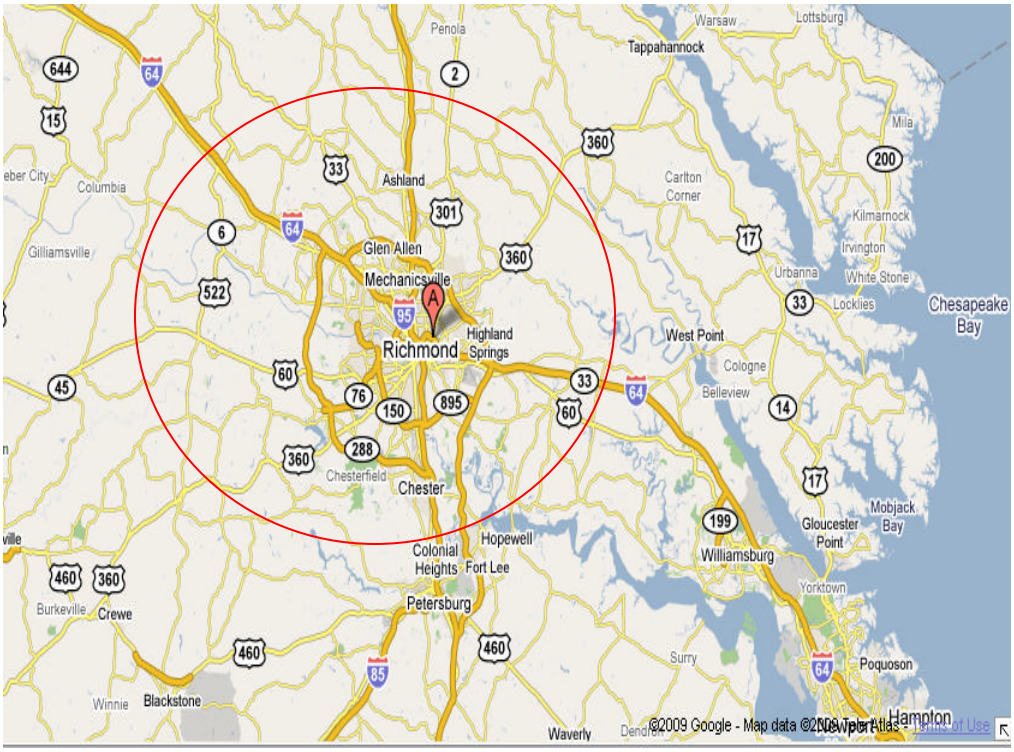


Figure 2. 50 km radius circle around the MSIC NCore site



Site Description and Spacing:

9 VAC 5-20-200 Air Quality Control Region: State Capital Intrastate AQR
CBSA: Richmond-Petersburg MSA
Site Name: MathScience Innovation Center
AQS ID: 51-087-0014
Location: 2401 Hartman St.
County: Henrico
GPS Coordinates: 37.5583, -77.4003
Date Established: June 12, 1981

The monitoring site is located on the site of the old central gardens elementary school. The monitoring site was established in 1981 and has had monitoring equipment there continuously since that time. The site is located less than 5 miles from Richmond International Airport.

NCore Siting Criteria

Appendix E to 40 CFR Part 58-*Probe and Monitoring Path Siting Criteria for Ambient Air Quality Monitoring* contains specific location criteria applicable to NCore siting. The site underwent a Technical Services Audit in August of 2008 and the finding of the audit was that the location meets all of the citing criteria in Part 58.

Site Details

The picture above was taken in January, 2009 and is looking south. The picture includes all the equipment that is operating at the site as of this writing. On the left of the picture in the back of the shelter is the NOy converter and is the location that the Meteorological tower is going to be placed. On the roof of the shelter is the PM2.5 FRM, PM2.5 everyday sampler and the low flow PM10 monitor. Note the Speciation monitor in the foreground.